ANNUAL SUMMARY FOR 1890.

The following general discussion of the weather over the United States during 1890 is based upon 7 charts, published herewith, which show, respectively, the annual mean temperature and the departure from the normal temperature; the annual mean atmospheric pressure and the prevailing wind; the maximum temperature; the minimum temperature; the absolute ranges of temperature; the annual precipitation; and the departure of the annual precipitation from the annual normal precipitation. These charts have been prepared from data received from 1,504 regular and voluntary observers of the Signal Service. An index of the MONTHLY WEATHER REVIEW for 1890 is also published herewith.

TEMPERATURE.

The annual mean temperature was highest in extreme south Florida, in the lower Rio Grande valley, and at stations in extreme southeast California, where it was above 75°; over the Florida Peninsula, along the west Gulf coast, and in the lower Colorado and middle and lower Gila valleys the mean values were above 70°. The annual mean temperature was lowest in the lower Saint Lawrence valley, in north Ontario, in Manitoba, and at elevated stations in central Colorado, where it was below 35°; the annual mean temperature was below 40° north of a line traced from Cape Breton Island westward to south North Dakota, and thence over northeast Montana into the British Possessions; and the mean values were below 50° north of a line traced from the south New England coast westward to north-central Colorado, thence southward to northeast Indian Territory, thence north of west to east California in about latitude north 38°, thence north and east of north to east-central Washington, and thence to southwest Washington; the annual mean was also below 50° in the mountains of north-central Virginia and central West Virginia.

The annual mean temperature was above the normal, except on the middle and north Pacific coasts and the adjoining part of the plateau region, in north New England and northeast New York, and over south Florida. The most marked departure above the normal temperature occurred from the North Carolina coast to central Mississippi, in areas in the middle Ohio valley, the west-lower and east-upper lake region, in the Red River of the North Valley, at stations in central New Mexico and central Kansas, and in the lower Rio Grande valley, where it exceeded 1°.5, and the greatest departure below the normal temperature was noted in southwest Maine and north-central Nevada, where it was more than 2°.

Along the Atlantic coast from south New York to Georgia, and at stations in the east Gulf states, Kentucky, Tennessee, southeast Texas, west-central Arkansas, south-central Kansas, north Colorado, central New Mexico, southeast Arizona, and at Los Angeles, Cal., the annual mean temperature was the highest ever reported, the most marked departure above the highest annual mean previously reported being noted at Charlotte, N. C., and Knoxville and Chattanooga, Tenn., where it was more than 1°. At Cleveland, Ohio, Jacksonville and Pensacola, Fla., Shreveport, La., and Pittsburgh, Pa., the annual mean temperature was the same as the highest annual mean recorded for preceding years. No unprecedentedly low annual mean temperature was reported for the current year.

The highest absolute maximum temperature reported by a regular station of the Signal Service was 115°, at Yuma, Ariz., July 22d. The reports of voluntary observers show maximum temperature 120° and above in San Bernardino and San Diego counties, California, east of the San Bernardino range of mountains, and along the Colorado River in west Arizona. The maximum temperature was 110° or above in the Sacramento Valley, and from the middle San Joaquin valley southeast over southeast California and west Arizona, and was generally above 100° over the west part of the plateau region, from the Rocky Mountains to the Mississippi River, and in areas in the east Gulf and south Atlantic states. The maximum temperature was lowest in extreme northwest Washington and on the coast of north California, where it was below 80°, and the maximum values were below 90° along the immediate middle and north Pacific coasts, at elevated stations in central Colorado and north-central New Mexico, in adjoining parts of Tennessee and North Carolina, in north-central Virginia and north West Virginia, at Key West, Fla., and on the southeast and extreme east New England coasts. The highest absolute temperature ever reported by a regular station of the Signal Service was 119°, at Fort McDowell, Ariz., in June, 1887, and at Phœnix, Ariz., in June, 1883.

The lowest absolute minimum temperature reported by a regular station of the Signal Service was —43°, at Fort Buford, N. Dak., February 26th. The reports of voluntary observers show minimum temperature below —45° in east Montana. Minimum temperature below —40° was reported over north North Dakota, and in north central and east Montana. At stations in the interior of Maine, in north New Hampshire, in the upper Missouri and Red River of the North valleys, at elevated stations in central Colorado, and in northeast Nevada the minimum values were below —30°; over north New England, north-lower and east-upper Michigan, north of a line traced from east-central Wisconsin south of west to central Colorado, and thence northwest to east Washington, and in north-central and extreme west-central Nevada they were below —20°. The minimum temperature was below zero in New England, save on the south coast, in New York, save in the west and southeast parts, at mountain stations in central Pennsylvania, and north of a line traced from south Michigan westsouthwest to north-central New Mexico, thence west-northwest to east California in latitude about N. 38°, and thence northward over central Oregon and Washington. The only sections in which the minimum temperature was above 32° (the freezing point) were the east Florida coast south of Titusville, extreme south Florida, along the immediate Pacific coast south of the 38th parallel, and in the lower Gila valley. The lowest absolute temperature ever reported by a regular station of the Signal Service was —63°, at Poplar River, Mont., in January, 1885.

The greatest yearly range in temperature, 143°, occurred at Fort Buford, N. Dak.; the range in temperature exceeded 120° from west Iowa north and northwest to the British Possessions, and in north-central Nevada; and it was more than 100° in north New England and northeast New York, and north of a line traced from north-lower Michigan southwestward to extreme north Texas, thence westward to west Nevada, and thence northward over central Oregon and Washington. The least yearly range in temperature occurred at Key West, Fla., where it was 41°; it was 50° at San Francisco, Cal.; less than 60° at points along the south and middle Pacific coasts and on the extreme north Pacific coast; and less than 70° over the Florida Peninsula, along the west Gulf coast, at Hatteras, N. C., and generally along the entire immediate Pacific coast.

ATMOSPHERIC PRESSURE.

The annual mean pressure was highest over the south Atlantic and east Gulf states, Florida, and Tennessee, where it was above 30.10, and was lowest over the west part of the southern plateau and along the west coast of the Gulf of Saint Lawrence, where it fell below 29.95. East of the 100th meridian and south of the Lake region, and on the middle and north Pacific coasts, the mean pressure was above 30.05.

PRECIPITATION.

The heaviest yearly precipitation reported was 99.85 inches at Neah Bay, Wash., and yearly precipitation to exceed 70.00 was reported in northwest California, central Arkansas, and central Louisiana. Along the immediate Pacific coast north of the 40th parallel and between the 36th and 37th parallels, within an area extending from east Texas and east Indian Territory northeastward to the New England coast, in east

Florida, east North Carolina, and in Nova Scotia and Prince Edward Island the yearly precipitation exceeded 50.00. The least yearly precipitation was noted in the lower Colorado and lower Gila valleys, and thence over southeast California, where it was less than 5.00 inches, and the yearly precipitation was less than 10.00 in extreme south and south-central California, thence northeastward over the middle plateau to Wyoming, and thence northward over central Colorado. The precipitation was also less than 10.00 in east Colorado and in extreme south-central New Mexico. The yearly precipitation was generally less than 20.00 from the 100th meridian to the Pacific coast ranges of mountains, and in south California.

The precipitation was in excess of the annual normal from northeast Texas and east Indian Territory northeastward over the Ohio Valley, the lower lake region, New York, and a greater part of New England and the Canadian Maritime Provinces, in extreme south Florida, parts of Wisconsin, upper Michigan, and southeast Wyoming, in the British Possessions north of North Dakota and east Montana, along the immediate middle Pacific coast, and from north California and south Oregon southeastward over Nevada and Arizona. The greatest excess in yearly precipitation occurred in the middle and upper Ohio valleys, and from west Tennessee over Arkansas, where it was more than 10.00 inches, and the excess was more than 6.00 inches from northeast Texas northeastward to west Maine.

At the following named regular stations of the Signal Service the yearly precipitation was the heaviest ever reported by the amounts given: Cleveland, Ohio, 47.82, 6.30 more than in 1879; Pittsburgh, Pa., 50.61, 7.44 more than in 1883; and Fort Smith, Ark., 64.63, 13.66 more than in 1888.

The greatest deficiency in yearly precipitation occurred on the middle coast of the Gulf of Mexico, where it exceeded 20.00 inches, and the deficiency was more than 10.00 inches generally along the Gulf and south Atlantic coasts, and in central and west Iowa. The deficiency was more than 8.00 inches in west Washington, and exceeded 4.00 inches over a greater part of the northern plateau, on the south Pacific coast, from east Colorado northeastward over Minnesota, and eastward to Illinois, in north Ontario, and in east Maine.

At the following-named regular stations of the Signal Service the yearly precipitation was the least ever reported by the amounts given: Wilmington, N. C., 41.33, 8.26 less than in 1875; Pensacola, Fla., 47.02, 5.29 less than in 1887; Mobile, Ala., 42.51, 7.37 less than in 1889; Atlanta, Ga., 42.60, 7.71 less than in 1879; New Orleans, La., 42.17, 6.28 less than in 1889; Shreveport, La., 40.54, 1.68 less than in 1887; Brownsville, Tex., 25.55, 0.26 less than in 1876; Huron, S. Dak., 14.68, 2.37 less than in 1888; Fort Assiniboine, Mont., 9.76, 0.01 less than in 1889; Denver, Colo., 9.33, 0.18 less than in 1888; Omaha, Nebr., 12.08, 7.84 less than in 1887; Salt Lake City, Utah, 10.33, 0.61 less than in 1880.

The heaviest yearly precipitation commonly occurs on the extreme north Pacific coast, where it averages nearly 100 inches at Neah Bay, Wash., and in 1886 the precipitation at that place was 123.23. On the middle and south Pacific coasts the heaviest yearly precipitation occurred in 1884, when it varied from 34.92 at Sacramento, Cal., and 38.82 at San Francisco, Cal., to 40.39 at Los Angeles, Cal., and 27.59 at San Diego, Cal. The heaviest precipitation at Yuma, Ariz., 5.86, was also reported in 1884. In other sections of the country the years of heaviest precipitation varied. In New England the heaviest yearly precipitation, 65.53, was reported at Boston, Mass., in 1878; in the middle Atlantic states, 70.72, at Norfolk, Va., in 1889; in the south Atlantic states, 102.40, at Hatteras, N. C., in 1877; in the Gulf States, 90.97, at Mobile, Ala., in 1881; in the Ohio Valley and Tennessee, 73.87, at Knoxville, Tenn., in 1875; in the Lake region, 60.24, at Buffalo, N. Y., in 1878; in the upper Mississippi valley, 61.58, at Cairo, Ill., in 1882; in the Missouri Valley, 52.06, at Leavenworth, Kans., in 1877; in the extreme northwest, 34.01, at Moorhead, Minn., in 1882; in the Rocky Mountain and plateau regions, 25.67, at Fort Assinniboine, Mont., in 1884; 23.64, at Salt Lake City, Utah, in 1875; 33.55, at Dodge City, Kans., in 1881; and 48.45, at Fort Sill, Ind T., in 1877.

The following are among the more notable meteorological features of the year: Over a greater part of the country east of the Mississippi River the winter of 1889–'90 was the warmest on record. On January 12th destructive local storms occurred in the middle Mississippi and Ohio valleys. During the passage of a tornado over Saint Louis, Mo., three persons were killed and several were injured, and hundreds of houses were blown down or damaged. At Clifton, Ky., 10 persons were killed and about 50 were injured, and immense damage was caused to buildings. On this date a heavy snow storm, with high wind and falling temperature, prevailed over Minnesota, the Dakotas, Nebraska, Kansas, and Iowa, and caused a general blockade of the railroads from Minnesota and the Dakotas southwestward over Kansas. On the 12th and 13th the storm along the lower lakes and on Lake Huron was one of the severest in many years, and was attended by fatalities and great destruction of property. The heaviest snow blockade ever known on the Central Pacific Railroad occurred during the latter half of the month, when about 120 miles of the railroad crossing the summit of the Sierra Nevada Mountains was blockaded. In the northern counties of Nevada the excessive snowfall caused great loss of live stock. At stations in north Montana, north Nevada, and California the month was the coldest January on record. In the early part of the month floods destroyed millions of dollars worth of property in south Missouri, east Arkansas, and north and east Texas. In the latter part of the month floods, resulting from melting snow, caused great damage in north California. A remarkable feature of the month was the enormous quantity of Arctic ice encountered near Newfoundland and the Grand Banks, where, as a rule, but little ice is encountered in January.

February was the warmest February on record in the Atlantic coast and Gulf states, and in areas in the Ohio Valley and Tennessee. A cold wave the latter part of the month caused great loss of stock on the ranges in east Oregon and northeast Nevada. The great depth of snow in the cuts along the line of the Central Pacific Railroad crossing the summit of the Sierra Nevada Mountains caused serious interruption to the train service. Lakes Erie and Huron were reported practically open to navigation. Destructive floods occurred in west Oregon and north California in the early part of the month. The rivers were generally above the danger-line in the Ohio, Cumberland, Tennessee, and lower Mississippi valleys during the latter part of the month, and great damage was caused by the overflow of streams in Ohio and west Kentucky. The Verde and Gila Rivers, Ariz., overflowed their banks, and a large storage dam on the Hassayampa River, Ariz., gave way, causing loss of life and destruction of property.

In March a great flood prevailed in the lower Mississippi valley, and at most of the important points along the lower Mississippi river the water was the highest ever known. Flood conditions also prevailed along the Ohio River and its tributaries, and at the close of the month the rivers were above the danger-line from Cincinnati, Ohio, to the Gulf of Mexico. On the 27th a group of destructive tornadoes occurred in Kentucky, south Indiana, south Illinois, and southeast Missouri. In Kentucky upwards of 100 lives were lost, and property to the value of about $4,000,000 was destroyed. In Louisville alone the loss of life was 76, and many persons were injured, and the loss to property aggregated about $2,500,000. At Jeffersonville, Ind., many buildings were demolished by the Louisville tornado which crossed the river at that point, without, however, an attendant loss of life. In Illinois 7 lives were known to have been lost, and the damage amounted to at least $200,000. In southeast Missouri 4 lives were lost, while the damage to property was not heavy. Cold waves of unprecedented seasonal severity swept over the southern and southeastern states during the first and middle parts of the month, and on the 2d the heaviest snow storm in the history of that station occurred at Charleston, S. C.

In April the great flood in the lower Mississippi valley continued. Among the more important crevasses which occurred were those at Catfish Point, Miss., at the Opossum Fork levee, and at the great Morganza levee. At the close of the month not less than 15 parishes, or about one-fourth of the state of Louisiana, had been affected by the flood; about 10,000 acres had been inundated in Mississippi by the Austin crevasse which occurred March 30th; and on the Arkansas side of the river about 10,000 acres had been inundated. Water from the Nita crevasse, which occurred March 13th, had found its way into Lake Pontchartrain by means of the Manchac Passes.

In May the flood along the lower Mississippi river subsided gradually. A rise in the Red River caused the overflow of a considerable extent of country in northwest Louisiana and southwest Arkansas. Damaging floods occurred in Ontario, Canada; along the Brazos River, Tex.; in central New York and northeast Pennsylvania; along the Willamette River, Oregon; along the upper Potomac River; in Fresno and Tulare counties, Cal.; and along the Carson River, Nev. A noteworthy tornado occurred at Akron, Ohio, on the 10th. A remarkable ærolite passed over the northwest counties of Iowa on the 2d.

In June the lower Mississippi river fell below the danger-line at New Orleans, La., on the 12th, and continued to fall slowly during the month. Floods were reported along the Carson River, Nevada, in Ontario, Canada, in central New York, northern Illinois, and southern Wisconsin. Drought injured crops and vegetation in areas in the south Atlantic and Gulf states, and in the lower Missouri valley. Destructive tornadoes occurred at Bradshaw, Nebr., and in Lee, Livingston, and Pratt counties, Illinois.

In July tornadoes, destructive to life and property, occurred in Ramsey and Wabasha counties, Minnesota, at Marshall, Minn., at Wesley, Ill., and Lawrence, Mass. Damaging drought prevailed generally in Kansas, Nebraska, and Iowa, and in areas in the Ohio Valley and Tennessee, the Lake region, and the Atlantic coast states from Massachusetts to Alabama. Navigation was suspended on the upper Ohio river, and on the Cumberland River, at Nashville, Tenn., on account of low water, and the Arkansas River, at Fort Smith, Ark., was lower than at any time since April, 1887.

In August a West India cyclone moved from east of the Windward Islands to northwest of Bermuda from the 27th to 31st, with winds of hurricane force and loss of life and shipping. On the 19th a tornado occurred at Wilkes Barre, Pa., killing sixteen persons and destroying property the value of $600,000. On the 12th the Arkansas River was lower at Fort Smith, Ark., than at any time since 1856. Considerable damage was caused by flood along the Gila River, Arizona.

In September a notable feature was the severe cold wave which advanced from the northwest over the central valleys west of the Mississippi River on the 13th, attended by unprecedentedly low temperature for the season and early frost. Destructive floods prevailed in central and western New York, central and western Pennsylvania, West Virginia, Ohio, and Connecticut from the 10th to 15th.

In October a tornado occurred in Richmond and Robeson counties, North Carolina, on the 16th. Considerable damage was caused by freshets in the Monongahela and Little Kanawha rivers, W. Va.; a freshet occurred in the Wyoming Valley, Pa., and the Cape Fear River flooded its banks near Wilmington, N. C. Very dry weather prevailed in parts of Nebraska, Kansas, Missouri, South Dakota, and south Minnesota. Destructive prairie fires occurred along the Cannon Ball, Heart, and Knife rivers, N. Dak., in the early part of the month.

November was the driest and warmest November on record in the middle, south Atlantic, and east Gulf states, and generally along the Pacific coast. A tornado occurred near Erie, Pa., on the 17th. On the 29th a destructive storm prevailed over Newfoundland, and on the 30th a heavy gale caused damage at Bermuda Island. High water and floods were reported along the Gila and Colorado rivers in west Arizona.

A notable feature of December was the unusually low temperature which prevailed over the extreme northeast part of the country and the abnormally warm weather in the north-central districts. Precipitation was deficient over a greater part of the country, the regions of greatest excess being the north Pacific coast and Cape Breton Island. A tornado passed over Jersey, Walton Co., Ga., on the 8th. Navigation closed generally on the Great Lakes, and the rivers of the north-central and northeast sections were generally closed by ice.

OCEAN FOG IN 1890.

The following table shows the number of days in each month for which fog was reported on the north Atlantic Ocean along, or near, the trans-Atlantic steamship routes, west of the 40th meridian, in 1890:

Month.	Between W. 40° and 55°.	Between W. 55° and 65°.	West of 65°.	Month.	Between W. 40° and 55°.	Between W. 55° and 65°.	West of 65°.
January	4	9	8	August	21	11	9
February	13	6	5	September	15	4	1
March	9	8	6	October	19	3	0
April	11	11	9	November	10	6	6
May	29	20	17	December	3	0	0
June	16	15	9				
July	26	14	10	Totals	176	107	80

In May, July, and October there was an unusual prevalence of fog near the Banks of Newfoundland; for other months there was less than the usual amount of fog in that region. In May and August the foggy days were in excess of the average number for the respective months, between the 55th and 65th meridians. West of the 65th meridian there was a deficiency in the number of foggy days, except in July. As shown in the discussion of ocean fog in the MONTHLY WEATHER REVIEW during the last three years the development of fog along the trans-Atlantic steamship routes west of the 40th meridian is largely dependent upon the conditions which exist in the east quadrants of general storms which advance over the ocean from the American continent.

Annual summary for 1890—*Signal Service stations.*

State and station.	Temperature—degrees Fahrenheit.						Precipitation in inches.		
	Mean annual.	Departure from normal.	Extremes for 1890.				Total 1890.	Departure from normal.	Percentage of normal.
			Max.	Date of max.	Min.	Date of min.			
Alabama.	°	°	°		°		*Inches.*	*Inches.*	
Auburn	65.7	.....	95	June 29, July 1	18	Mar. 2	46.34	.....	....
Mobile	68.3	+0.8	97	June 29	25	Mar. 2	42.51	—20.59	67
Montgomery	67.1	+1.2	98	June 29	21	Mar. 2	48.18	— 5.20	90
Arizona.									
Fort Apache	55.3	+1.1	97	July 8	8	Jan. 15	26.72	+ 4.12	118
Fort Bowie	60.9	—0.5	95	June 11, July 22	18	Jan. 12	17.65	— 0.96	95
Fort Grant	61.5	+0.8	96	July 22	19	Jan. 15	16.74	+ 0.39	102
Fort Thomas	64.9	+2.6	108	July 22	18	Feb. 13	13.93	+ 0.68	105
San Carlos Agency	64.3	.....	109	July 22, 27	20	Jan. 20, 23, Feb. 13	18.62	.....	....
Willcox	60.0	+0.3	104	July 22	14	Nov. 28	17.93	+ 5.54	145
Yuma	72.9	+1.0	115	July 22	30	Jan. 12	4.67	+ 1.61	152
Arkansas.									
Fort Smith	62.0	+1.4	101	July 17	7	Feb. 28	64.63	+20.63	147
Little Rock	62.8	+0.4	97	July 1	16	Mar. 1	63.72	+ 9.52	118
California.									
Eureka	50.6	—0.7	78	May 24	27	Feb. 27	55.54	.....	....
Fresno	62.6	.....	111	July 25	24	Jan. 7, 11	8.36	— 0.64	93
Keeler	60.3	—0.6	103	July 25	16	Jan. 7	3.74	.....	....
Los Angeles	63.6	+1.4	105	June 7	34	Jan. 12	12.69	— 5.71	69
Point Reyes Light	.....	.....	82	May 23	32	Jan. 8	25.57	+ 4.39	121
Red Bluff	61.5	—0.6	110	July 23	22	Jan. 14	25.60	— 0.67	97
Sacramento	59.4	—0.6	102	July 25, 26	29	Jan. 8	20.95	— 0.62	97
San Diego	61.7	+0.9	93	June 6	35	Jan. 11	8.02	— 2.96	73
San Francisco	56.3	—0.4	86	Oct. 28	36	Jan. 5	25.43	+ 0.79	103
Colorado.									
Denver	51.0	+1.2	97	July 28	— 8	Feb. 28	9.33	— 5.00	65
Montrose	49.7	—0.1	96	July 28	—13	Feb. 28	9.10	— 0.26	97
Pueblo	52.4	+0.4	100	July 7, Aug. 7	—14	Feb. 28	8.31	— 3.99	68
Connecticut.									
New Haven	49.6	+0.6	91	July 8	4	Mar. 7	48.95	— 1.27	97
New London	50.5	+1.1	88	July 16	7	Mar. 7	48.85	— 0.25	99
District of Columbia.									
Washington City	56.3	+1.2	98	July 8	13	Mar. 7	41.59	— 2.85	94
Florida.									
Jacksonville	70.6	+0.7	97	June 27, 28	27	Mar. 2	47.52	— 8.08	85
Jupiter	74.5	.....	95	June 27	33	Mar. 3	61.35	.....	....